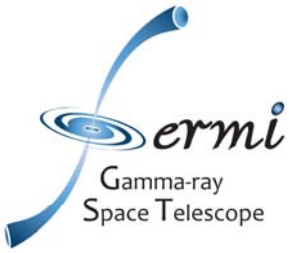


On-Orbit Performance of the Fermi Gamma-ray Burst Monitor

Charles Meegan
NASA/MSFC

For the GBM team

Outline

- Instrument description
- Background rates and spectra
- On-board trigger
- Localizations
- Spectra
- Future improvements

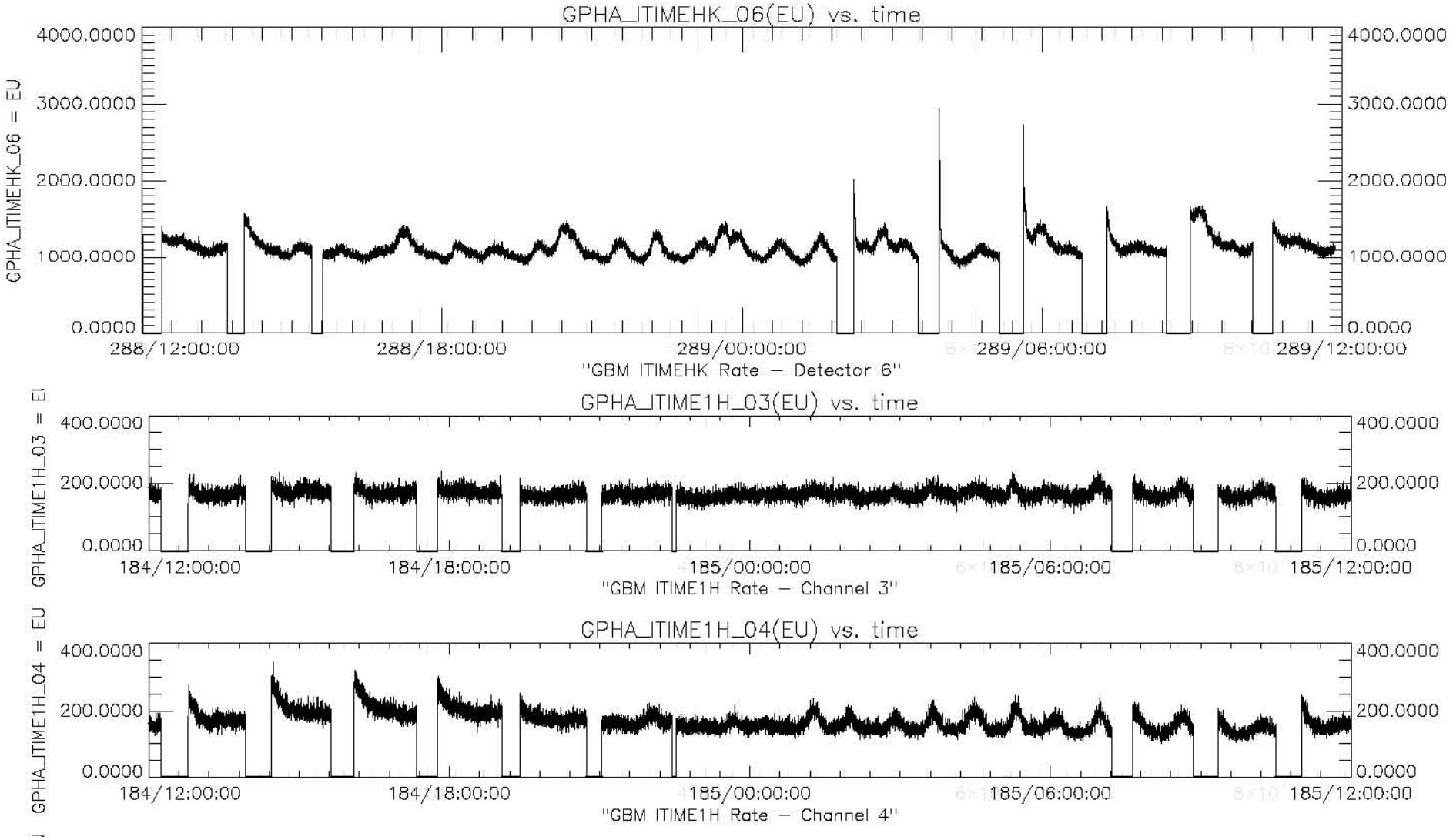
Instrument Overview

12 NaI detectors
8 keV to 1 MeV

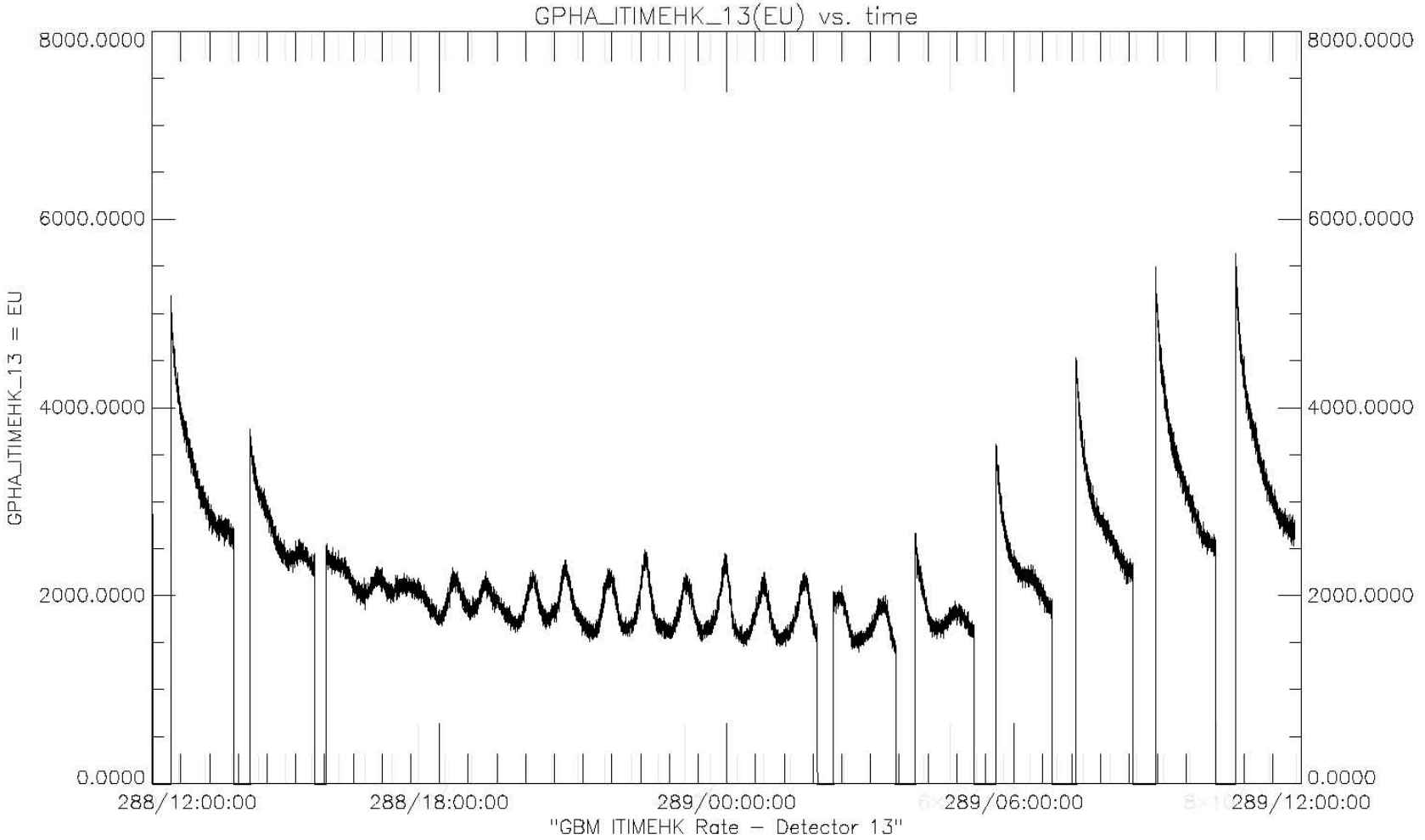
2 BGO detectors
200 keV to 30MeV

See Bhat et. al. poster for details

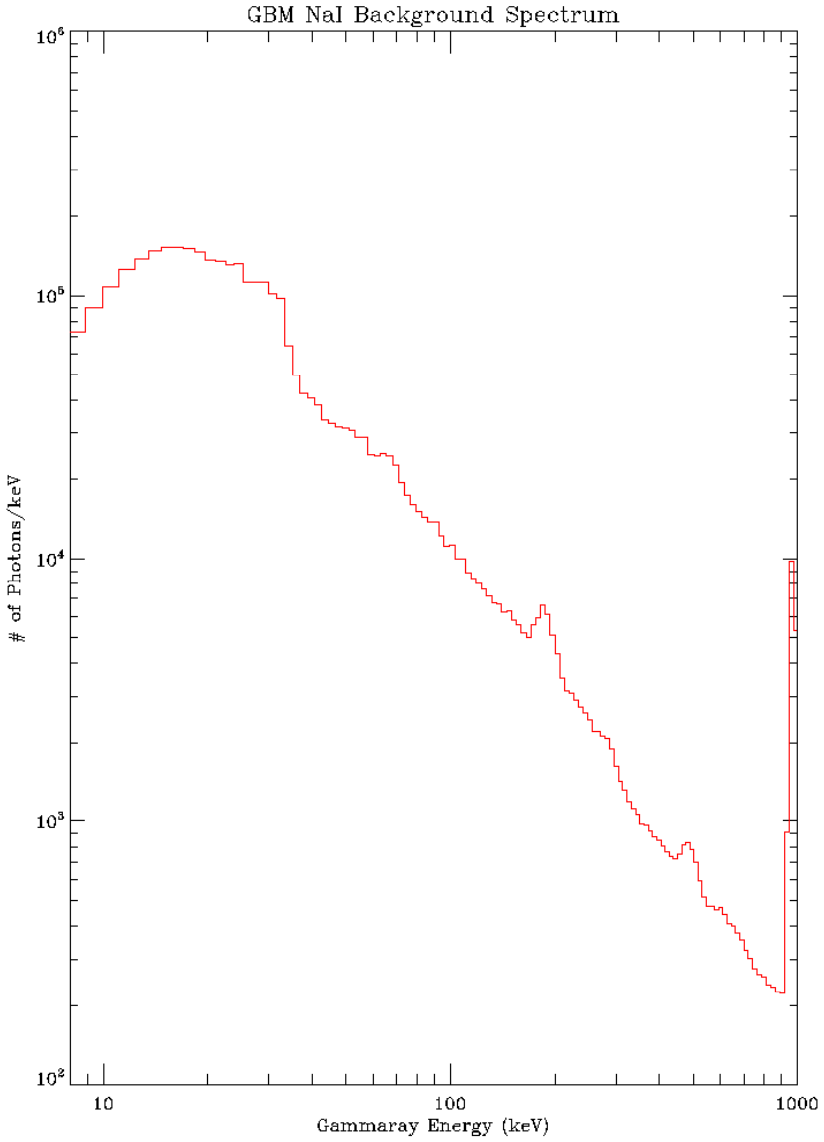
NaI Background Rates

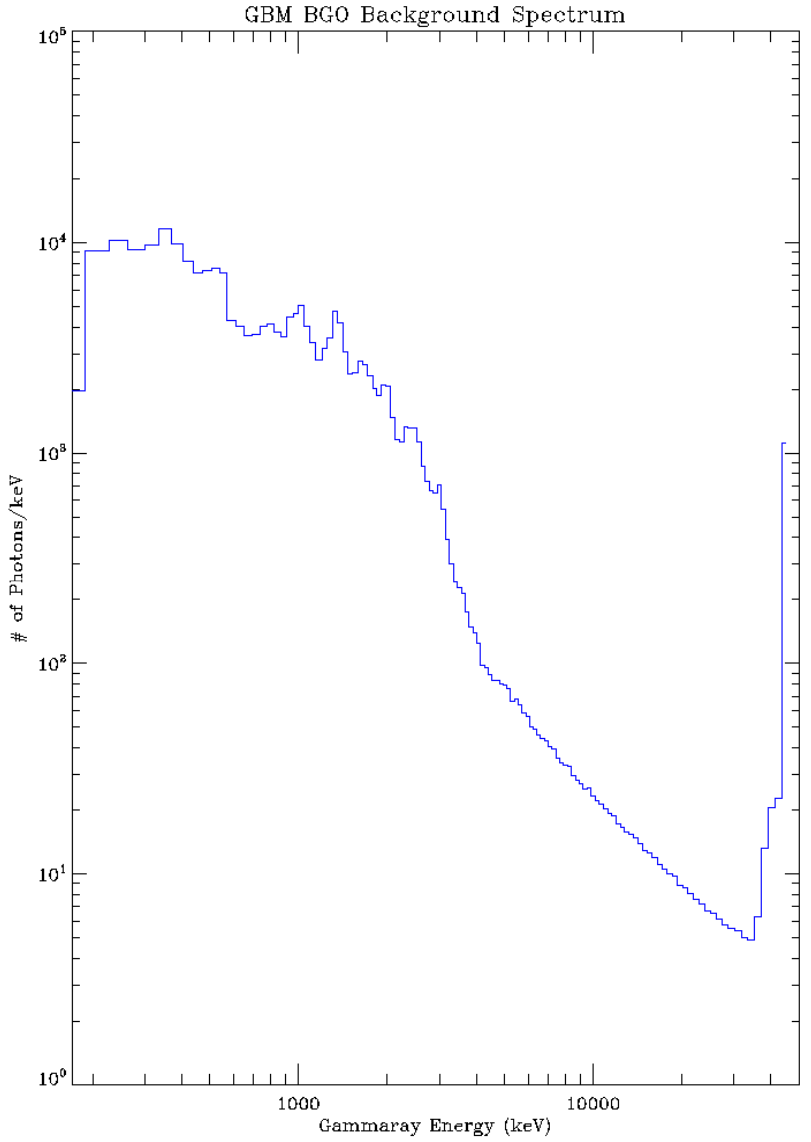


BGO Background Rates



Background Spectra



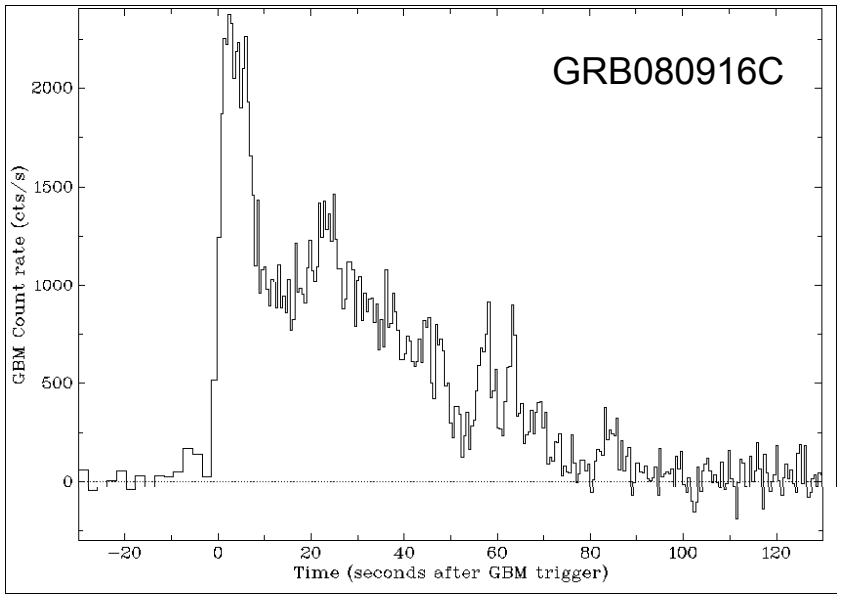


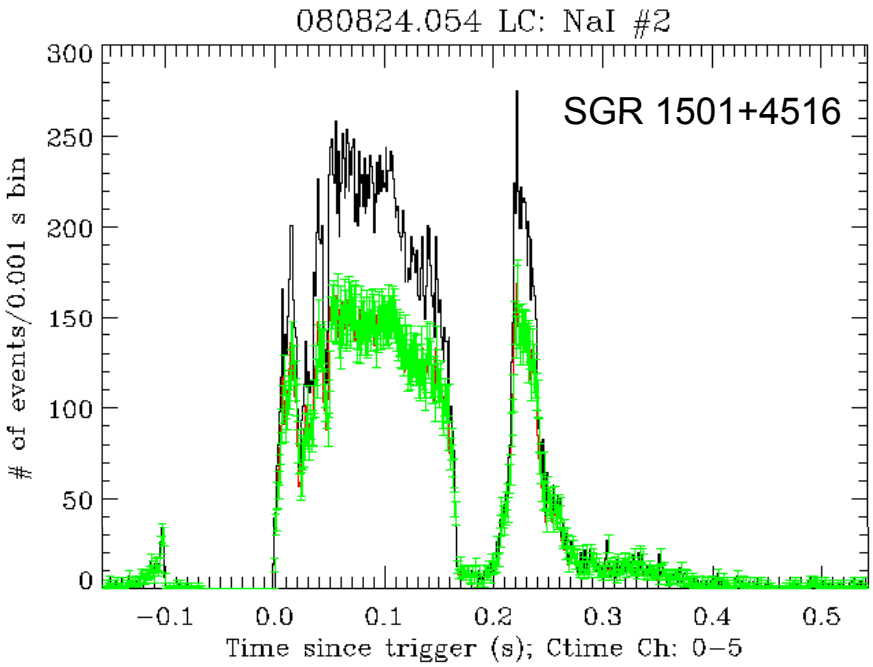
On-board Trigger Algorithm

- Four energy ranges: 25-50, 50-300, >100, >30(keV)
- Eleven integration times: 16 ms – 8 s.
- Two timing phases
- Threshold of 4.5 sigma for 50-300 keV, 64 ms – 4 s
- Background rate 50-300 keV is ~320 counts/s
- Flux threshold for 1 s burst, 50-300 keV: ~0.75 photons/cm^2/s
- Prediction of 200 bursts/year with BATSE-like trigger

Trigger Classes

- **137 triggers in 100 days**
  - **69 GRBs – 250 per year**
  - **27 SGR 1501+4516**
  - **7 AXP 1E1547.0-5408**
  - **5 TGF**
  - **29 Other (particles, Cyg X-1, accidental, unknown)**





On-Board Localizations

- Needed to perform autonomous repoint (~15° accuracy)
- Compares normalized NaI rates to a table (~5° grid)
- Includes spacecraft scattering
- Includes atmospheric scattering approximately
- Assumes typical burst spectrum
- Finds optimal time interval
- Average distance from best location: ~12°

Ground Localizations

- **Automated**
  - **Similar to on-board algorithm**
  - **Finer search grid (1° vs. 5°)**
- **Interactive**
  - **User selected time intervals for burst & background**
  - **Average systematic error ~3°**

See Briggs et. al. poster for error analysis

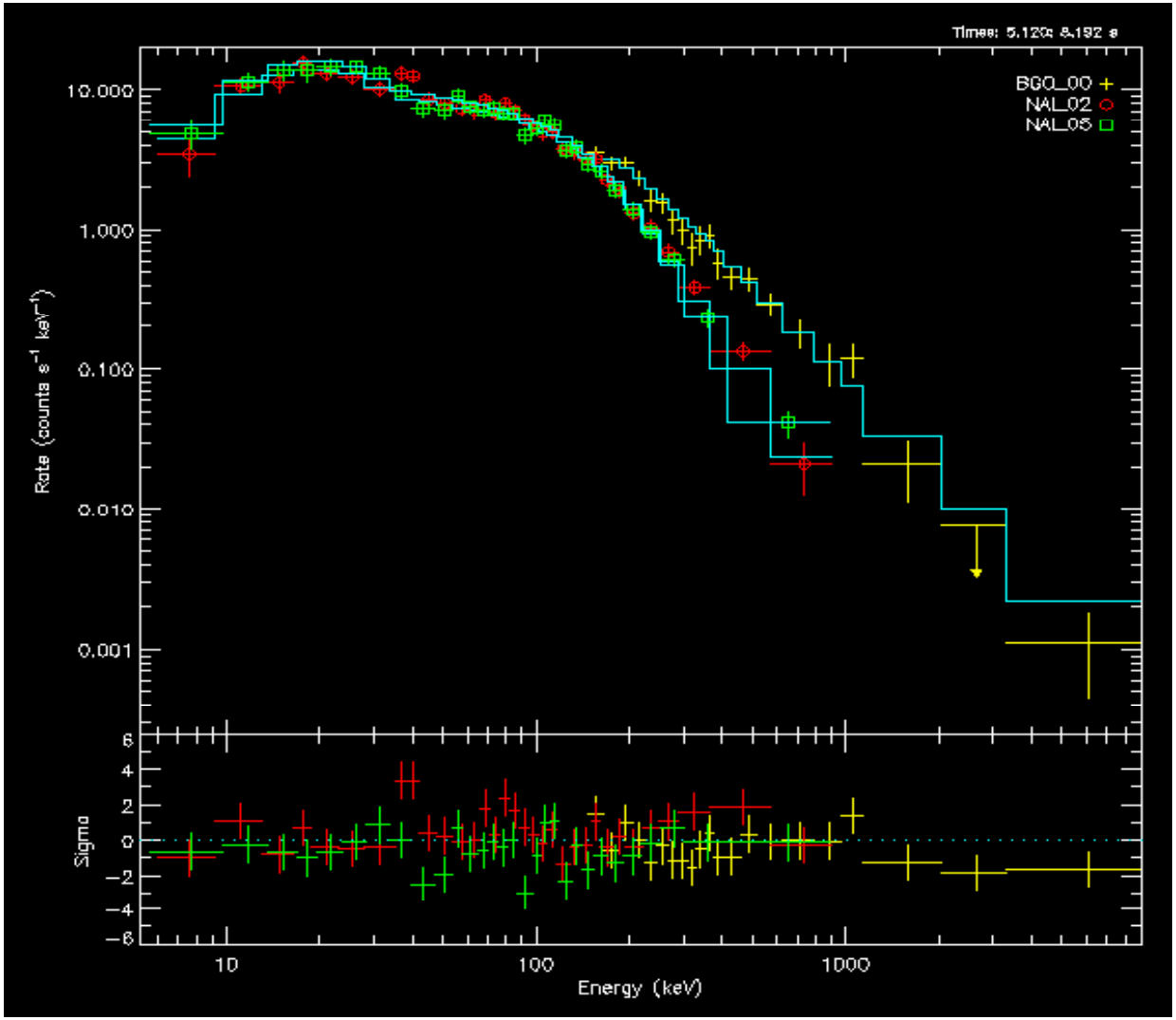
Spectrum of GRB080817

Band function:

α = -0.5

β = -2.1

E_{peak} = 280 keV



Future Improvements

- Refinement of classification parameters
- Improved atmospheric scattering
- Possible major changes to repoint algorithm
  (if we discover better predictors of high energy emission)